

**COLORADO RIVER RECOVERY PROGRAM
FY 2019 ANNUAL PROJECT REPORT**

Project No: 19

I. Project Title: General Hydrology Support

II. Bureau of Reclamation Agreement Number(s): R18PG40023

Project/Grant Period: Start date: 10/1/2017

End date: 9/30/2022

Reporting period end date: Ongoing

Is this the final report? Yes _____ No x

III. Principal Investigator:

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IV. Abstract:

The Service's hydrologist provides basic hydrology support to Recovery Program operators and researchers. Accomplishments during FY 2018 include: (1) coordinating and posting temperature data for sites on the Colorado, Green, Yampa, and Gunnison rivers, (2) providing technical hydrology support for a wide range of Recovery Program activities; and (3) supporting the Recovery Program in basic data collection and monitoring of project efforts relating to hydrology.

V. Study Schedule: Initial Year – 1990 Final Year – Ongoing

VI. Relationship to RIPRAP:

General Recovery Program Support Action Plan:

I.A.4.b. Conduct needed Geomorphology research and monitoring.

Green River Action Plan: Mainstream

I.A.3. Deliver identified flows.

Colorado River Action Plan: Mainstream

I.E. Evaluate and revise as needed flow regimes to benefit endangered fish populations.

Colorado River Action Plan: Gunnison River

I.D. Evaluate and revise as needed flow regimes to benefit endangered fish populations.

Yampa River Action Plan:

I.B.2 Provide augmentation of low flows.

Duchesne River Action Plan:
1.D Coordinate reservoir operation

VII. Accomplishment of FY 2019 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

The Recovery Program's Director's Office (PDO) provides basic hydrology support to Recovery Program researchers and undertakes tasks that support the Recovery Program with basic data collection, monitoring, partner coordination, flow augmentation, data analysis, and data summaries and reporting. The work provided is, in large part, supportive of other research projects or collaborative activities such as flow delivery, flow quantification, and habitat restoration, all of which have a direct impact on the recovery of the Colorado River endangered fish.

1. Stream Temperature Data Collection

One Recovery Program task is the collection of water temperature data in various reaches of Upper Basin rivers. Temperature monitoring duties are divided between the PDO staff in Lakewood and the Colorado River Fishery Project's Grand Junction field station (CRFP-GJ)¹. PDO staff currently collects data from seven locations on the Yampa and Green Rivers, as described below. Two monitoring sites on the Gunnison River were terminated in 2018 after determining that the original objectives of their 1992 installation were fulfilled (primarily, to validate temperature model assumptions). Several new temperature sites were provisionally established on the White River in 2018 for possible longer-term monitoring, to aid in identifying most productive smallmouth bass removal efforts. CRFP-GJ currently collects water temperature data from five sites on the mainstem Colorado River, four sites on the Gunnison River and one site on the Uncompahgre River, as described in the separate Project #19b annual report. These data are downloaded semiannually, quality-checked, and assembled into an Excel temperature database for use by Recovery Program researchers, following the format used by USGS in their Water Resources Data yearbooks. The PDO web-enables them and links them to the Riverdata webpage: <http://www.fws.gov/mountain-prairie/riverdata/>. GPS locations for each thermograph are available by request; for security purposes the exact locations are not provided on the web page.

Temperature data for FY19 were downloaded in the field in August 2019 by Jim Renne, Program volunteer. The data collection went well, with all seven sites yielding what appear to be complete and valid data for the period. The one-hour interval readings from the previous year (FY18) were converted to daily means, and site-specific daily-mean tables completed during winter 2018-19. Temperature data for FY19 are currently being processed for uploading to the Program website. This work should be completed by January 2019.

The PDO maintains a summary table of site information for all known long-term stream temperature monitoring locations in the upper Colorado River basin, including those managed by

¹ Temperature data collection on the Colorado River by CRFP was consolidated in this Scope of Work beginning in FY- 99 and a separate budget table is included for this work. See annual report 19b General Hydrology Support (CRFP-Grand Junction Contribution). Principal Investigators for 19b are Brendan Crowley and Dale Ryden.

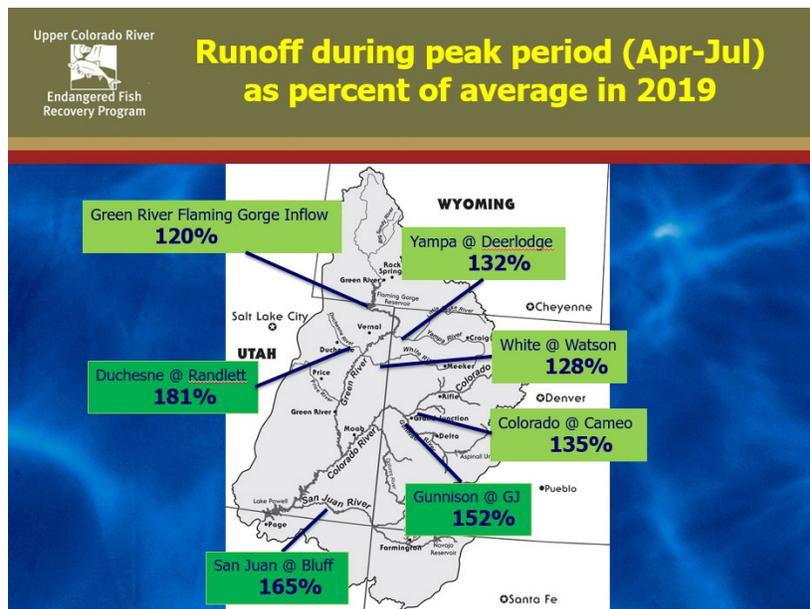
cooperating entities such as USGS, Colorado State University, and the State of Utah. The purpose is to have a centralized inventory of this information to help address such questions as where temperature data are collected, why those sites were selected, and how the data are used by the Program.

Jana Mohrman (Program Hydrologist through December 2016) analyzed data and prepared a draft report “*Evaluation of Data from Two Gunnison River Temperature Monitoring Stations Discontinued in 2018 by the Program Director’s Office*”, to document the rationale for continuing those two sites originally established in 1996, and to provide some analysis of the information gleaned from those sites. Don Anderson assisted with preparation of that document, which should be completed early in FY2020.

2. Hydrology Support for Program Implementation and Monitoring

Overall, runoff in the Upper Colorado River basin in Water Year 2019 was well above-normal, resulting in unregulated inflow to Lake Powell that was 122% of average. As of October 1, 2019, the storage content of Lake Powell, at 13.27 million acre-feet, was 2.41 million acre-feet greater than one year earlier.

Runoff conditions varied from one sub-basin to the next, but runoff was above-average in all major subbasins. April-through-July runoff measured at various gage locations is shown in the graphic below, as percent of average (1981-2010). Peak season runoff was highest in the Duchesne River basin (at 181% of average) and lowest for Flaming Gorge inflow (at 120% of average).



Peak mean daily flows observed at key gaging locations in the upper Colorado River basin are summarized below. Naturally elevated spring flow in the Green River at Jensen was augmented in 2019 with an intentional, targeted ramp-up of releases from Flaming Gorge Reservoir aimed at maximizing the entrainment of larval razorback sucker from the Green River into Stewart Lake

and other floodplain wetlands. In the mainstem Colorado River, coordinated reservoir operations (CROS) were used to augment peak flows in 2019 (see Annual Report for Project C-14). In the Gunnison River, the Bureau of Reclamation successfully timed releases out of the Aspinall Unit to augment the natural peak in the North Fork Gunnison River and achieve a combined peak of 16,500 cfs at the Whitewater gage near Grand Junction (thus exceeding the wet year target of 14,350 for 10 to 15 days).

River / Location	Mean Daily Peak (cfs)	2019 Peak (cfs)	% of Avg Peak
Yampa @ Deerlodge	12,500	15,800	126%
Green @ Jensen	16,500	20,800	126%
White @ Watson	2,400	4,180	174%
Duchesne @ Randlett	3,200	6,460	202%
Gunnison @ Grand Junction	8,000	16,500	206%
Colorado @ Cameo	17,700	21,800 *	123%
San Juan @ Bluff	10,500	11,100	106%

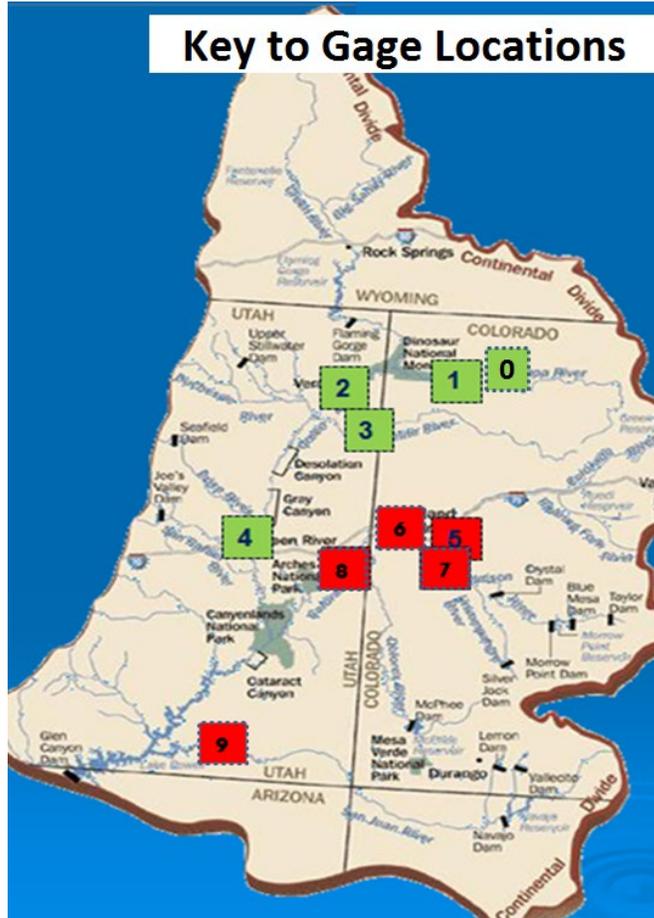
*Augmented with coordinated reservoir releases

The summer season throughout the Upper Colorado River Basin become unusually hot and dry by late July, and monsoon moisture remained scarce throughout the summer months, resulting in precipitous declines in natural streamflow by mid-summer in most Upper Colorado system tributaries. Thus, in spite of the well-above-average spring runoff, **base flows** observed during the August-through-October period of 2019 tended to be close to average, as summarized in the table below.

Map Key	River	Location	% of Aug-Oct Avg, (1981-2010)	Minimum mean daily cfs
0	Yampa	<i>Maybell</i>	90%	133
1	Yampa	<i>Deerlodge Park</i>	84%**	146
2	Green	<i>Jensen</i>	105%	1,510
3	White	<i>Watson</i>	92%	182
4	Green	<i>Green River</i>	91%	2,370
5	Colorado	<i>Cameo</i>	109%	2,280
6	Colorado	<i>Palisade</i>	127%*	858
7	Gunnison	<i>Grand Junction</i>	96%	1,160
8	Colorado	<i>Cisco</i>	100%	3,240
9	San Juan	<i>Bluff</i>	80%	786

*Based on WY1990-2010 average; pre-1990 data not available

** Based on WY1982-2010 average; pre-1982 data not available



As of this writing, considerable uncertainty surrounds next season’s snowpack development and resulting upper Colorado basin runoff. The Colorado Basin River Forecast Center forecast for Water Year 2020 unregulated inflow to Lake Powell, issued on October 1, 2019, projects a most probable (median) unregulated inflow volume next year of 9.5 MAF (88% of average). Their forecast ranges from a minimum probable of 6.7 MAF (62%) to a maximum probable of 18.0 MAF (166%). <http://www.usbr.gov/uc/water/crsp/cs/gcd.html>

Other support provided by the Program Hydrologist under this task item in FY19 included the following:

Mainstem Colorado 15-Mile Reach:

- Participated in weekly 15-Mile Reach coordination calls during the ‘April Hole’ and throughout summer/fall base flow operations.
- Coordinated requests for releases of endangered fish water from FWS pools in Ruedi, Granby, Green Mountain and Wolford Mountain Reservoirs to support summer base flows in the 15-Mile Reach. A total of 88,321 acre-feet were released from endangered fish accounts at these reservoirs between August 19 and October 31, 2019. This includes 2,676 acre-feet of maintenance releases from Wolford Mountain Reservoir by the

Colorado River District that were protected to and through the 15-Mile Reach, and 299 acre-feet of water leased from Ruedi Reservoir by the Roaring Fork Conservancy but surplus to their winter release needs, and therefore available to the Program for summer 2019 release. An additional 327 acre-feet was leased and released from Ruedi Reservoir by the Colorado Water Trust for the benefit of the Grand Valley Power Plant and the 15-Mile Reach in late August. Surplus water from the Green Mountain Reservoir Historic Users Pool was the single largest source of water used to supplement 15-Mile Reach summer base flows (53,833 acre-feet through October 31). Approximately 6,700 acre-feet remained in the HUP pool at the end of the season as carryover for possible delivery in 2020, prior to declaration of fill, and including possible delivery to an ‘April hole’ in 15-Mile Reach flows should one develop.

- Attended and presented at 2018 HUP ‘Wrapup’ Meeting (Grand Junction, March) and 2019 HUP Kickoff Meeting (Grand Junction, June).
- Attended and presented at Grand Valley Water Interests Meeting in GJ organized by Tom Pitts (June).
- Presented on Program to Middle Colorado Watershed Management Council (Rifle, May).
- Coordinated with the Colorado Water Trust on leased water releases for the 15-Mile Reach.
- Reassessed the estimated water savings associated with actual OMID system efficiency improvements made to date.
- Met with Redlands Water and Power to explore possible strategies for improving flows for endangered fish in the three miles of Gunnison River below their headgate diversion.

Yampa River:

- Determined not to lease any ‘temporary’ water from Elkhead Reservoir for Yampa flow augmentation purposes in 2019 (beyond the 5,000 AF Elkhead account already available).
- Initiated weekly Yampa Flow Coordination calls on August 14, 2019, with releases requested from FWS’s Elkhead Reservoir account from August 28 to October 17 to support base flows. A total 5,000 AF was used in 2019 for this purpose. Provisional gage data indicate that daily mean flow at the Yampa-Maybell gage fell below 200 cfs (the informal wet-year target) on 32 days, and below 134 cfs (the average-year target) on one day.
- Worked with states of Wyoming and Colorado to review and finalize their flow depletion reports for water development in the Yampa River basin through 2015, pursuant to the requirements of the 2005 Yampa PBO.

Green River:

- Prepared the 2019 Green River / Flaming Gorge Flow Request Letter and follow-up discussions with Reclamation and Flaming Gorge Workgroup on implementing requests.
- Participated in GREAT team discussions working toward finalization of the GREAT flow recommendations report.
- Established the funding conduit through USGS to fund Bestgen’s planned larval float field study in May 2020.
- Participated in discussions with NPS regarding design of Green River physical monitoring plan for 2020 and following years.
- Provided input for DOI’s comments on Water Horse LLC Green River water rights

application and for FWS's comments on Green River Canal Company water rights application in Utah.

Price River:

- Continued tracking State of Utah and TNC efforts to enhance Price River base flows and habitats to benefit native fish.

White River:

- Coordinated White River Planning Group meetings to review hydrologic analyses, revise White River flow recommendations, and identify a 'future depletions scenario' for White River Management Plan analysis and possible PBO coverage. Assisted with CWCB efforts to select consultant who will help prepare the White River Management Plan.
- Coordinated technical reviews and updates to the draft White River Interim Flow Recommendations.

Other/General:

- Post-2023 planning – Worked with Program water stakeholders to identify preferred and prioritized actions to adequately protect and augment instream flows post-2023, along with estimated costs.
- Presented the 2019 plan for Ruedi releases to the public in Basalt, Colorado, August 7. Coordinated with CWCB to manage releases of the 6,000 acre-feet of water leased out of Ruedi from the Ute Water District, and coordinated with Colorado Water Trust for their release of 327 acre-feet leased water from Ruedi.
- Participated in Dushesne River IBAT/DRWG spring planning meeting & fall review meetings via phone; reviewed draft 2012-2018 water management report prepared by Central Utah Water Conservancy District.
- Participated in Aspinall Unit/Gunnison River spring planning meeting in Grand Junction.
- With CWCB and Reclamation, prepared press release for the 2019 CROS operations.
- Made presentation to the Upper Colorado River Commission on the Recovery Program in June 2019 (Keystone, CO).
- Chesapeake Conservancy – Coordinated with CWCB to provide data and guidance for development of a GIS 'dashboard' and decision-support tool being developed by the Chesapeake Conservancy for water management in the 15-Mile Reach.
- Staffed the Recovery Program's trade booth at the Upper Colorado River Basin Forum (Grand Junction, November), annual Colorado Water Congress meeting (Denver area, January) and the Utah Water Users conference (St. George, March).

VIII. Additional Noteworthy Observations:

Activities independent of the Recovery Program beginning in 2019 that could provide significant instream flow benefits for endangered fish in future years include: establishment of the locally-managed Yampa River Fund, establishment of a 15-Mile Reach instream-flow augmentation effort by the Colorado Water Trust, and efforts to develop an integrated watershed management plan in both the Yampa River basin (spearheaded by the Yampa-White-Green Basin Roundtable) and the mainstem Colorado River above Rifle, Colorado (spearheaded by the Middle Colorado Watershed Council).

IX. Recommendations:

We recommend continuation of the current data collection efforts at the established gaging sites. The Program should seek a broader base of funding support for establishing and maintaining key streamflow and water quality monitoring locations. Consideration should be given to the continued collection of data at one or more of the provisional temperature monitoring sites originally established in 2018 on the White River.

X. Project Status: Ongoing and on-track.

XI. FY 2019 Budget Status:

- A. Funds provided: \$181,348
- B. Funds expended: \$181,348
- C. Difference: - 0-

XII. Status of Data Submission: Data submitted as completed

XIII. Signed: Don Anderson November 21, 2018
Principal Investigator Date